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A

Date: November 21, 1997

Hon. Commissioner of Patents and Trademarks
Washington, D. C. 20231

Re: Inventors: Floyd R. Dickson and Lino C. Mallia

For: STRUCTURAL WEB AUTOMOTIVE GRILLE GUARD

Atty. Docket No.: 7939-000006

Sir:

Transmitted herewith for filing is the above referenced patent application.

1. [X] Two (2) formal sheets of drawings showing Figures 1-3 are enclosed.

2. [X] A Verified Statement Claiming Small Entity Status is enclosed.

3a. [X] A check is enclosed to cover the fees as calculated below. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-0750. A duplicate copy of this document is enclosed.

3b. [ ] The fees calculated below will be paid within the time allotted for completion of the filing requirements.

3c. [ ] The fees calculated below are to be charged to Deposit Account No. 08-0750. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to said Deposit Account. A duplicate copy of this document is enclosed.

FILING FEE CALCULATION	Number Filed			Number Extra		Rate		Basic Fee $790.00
Total Claims	18	−	20 =	0	×	$22.00	=	-0-
Independent Claims	2	−	3 =	0	×	$82.00	=	-0-
Multiple Dependent Claim(s) Used						$270.00	=	
FILING FEE − NON-SMALL ENTITY								$790.00
FILING FEE - SMALL ENTITY: Reduction by 1/2 [X] Verified Statement enclosed. [ ] Verified Statement filed in priority application.								$395.00
Assignment Recordal Fee ($40.00)								$40.00
37 C.F.R. §1.17(k) Fee (non-English application)								
TOTAL								**$435.00**

4. [X] An Assignment of the invention is enclosed. The required cover sheet under 37 C.F.R. §3.11, §3.28 and §3.41 is attached.

5. [X] A signed Oath/Declaration [X] is enclosed [ ] will be filed in accordance with 37 C.F.R. 1.63.

6. [ ] **Foreign Priority**: Priority based on _____ Application No. _____, filed _____, is claimed.

7. [ ] A copy of the above referenced priority document [ ] is enclosed [ ] will be filed in due course, pursuant to 35 U.S.C. §119(a)-(d).

8. [ ] Because the enclosed application is in a non-English language, a verified English translation for examination purposes of same [ ] is enclosed [ ] will be filed as soon as it is available.

9. [ ] **Provisional Application Priority**: Priority based on United States Provisional Application No. _____, filed _____, is claimed under 35 U.S.C. §119(e).

10. [ ] A Preliminary Amendment is enclosed.

11. [ ] An Information Disclosure Statement, _____ sheets of PTO Form 1449, and _____ patent(s)/publications/documents are enclosed.

12. [ ] An Establishment of Assignee's Right To Prosecute Application Under 37 C.F.R. § 3.73(b), and Power Of Attorney is enclosed.

13. [X] An Express Mailing Certificate is enclosed.

14. [X] Other Acknowledgment postcard

Attention is directed to the fact that the address of this firm has been designated as the correspondence address for this application.

Respectfully,

Michael J. Schmidt
Reg. No. 34,007

HARNESS, DICKEY & PIERCE, P.L.C.
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Date: November 21, 1997

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

EXPRESS MAILING CERTIFICATE

Applicants: Floyd R. Dickson and Lino C. Mallia

Serial No. (if any): not yet assigned

For: STRUCTURAL WEB AUTOMOTIVE GRILLE GUARD

Docket: 7939-000006

Attorney: Michael J. Schmidt

"Express Mail" Mailing Label Number EH293849659US

Date of Deposit . . . . . November 21, 1997

I hereby certify and verify that the accompanying *transmittal letter (in duplicate); 12-page patent application along with executed Declaration and Power of Attorney; two (2) sheets of formal drawings showing Figures 1-3; Cover Sheet for Recordal of Document (in duplicate); with attached executed Assignment by Joint Inventors; Verified Statement Claiming Small Entity Status; and a check in the amount of $435.00 ($395.00 - filing fee; $40.00 - recordal fee)* are being deposited with the United States Postal Service "Express Mail Post Office To Addressee" service under 37 C.F.R. 1.10 on the date indicated above and are addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Angela O'Neil
Signature of Person Mailing Document(s)

UNITED STATES PATENT APPLICATION

for a new and useful invention entitled

STRUCTURAL WEB AUTOMOTIVE GRILLE GUARD

by Inventors:

Floyd Dickson
Lino Mallia

Docket No. 7939-000006

STRUCTURAL WEB AUTOMOTIVE GRILLE GUARD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to vehicle grille guards, and more particularly to a structural web automotive grille guard and a process for preparing the same.

2. Discussion

Current grille guards are typically made of a welded steel construction and are usually chrome plated to provide an attractive finish surface. However, such prior art steel grille guards are relatively heavy, which is highly undesirable. For example, heavy grille guards may cause the balance of the vehicle to be adversely affected which in turn can render steering more difficult.

Further, such prior art steel grille guards tend to be relatively expensive as to material cost, in view of the steel and chrome coating materials. Additionally, the manufacturing and labor costs tend to be high, due for example, from the need for welding the grille to the vehicle frame or chassis. Yet another possible problem with chrome coated grille guards is the likelihood that the chrome will wear away over time leaving the steel exposed and subject to unsightly rust.

In an apparent effort to address one or more of the perceived problems with steel grille guards, other prior art grille guards have been proposed which are formed from semi-rigid, self-skinning, foamed polyurethane with reinforcing metal strips, as in U.S. Pat. No. 5,215,343 or polycarbonate tubes as disclosed in U.S. Patent No. 4,168,855. However, the use of self-skinning foaming material or certain

thermoplastic resins presents problems with regard to strength and durability as compared to steel guards.

Thus, there exists a need in the art to produce a vehicle grille guard that is lightweight, cost effective, and of high strength. The present invention provides a structural web injected plastic grille guard that can be produced cost effectively, is lightweight and non-corrosive but maintains an effective combination of rigidity and flexibility.

SUMMARY OF THE INVENTION

The present invention provides a new and improved process of producing vehicle grille guards by gas-assisted injection molding and the grille guards produced thereby. The process of producing the vehicle grille guard of the present invention includes injecting a plastic resin into a mold cavity in an amount less than the total volume of the mold cavity. An inert gas is then injected into a center portion of the cavity and a hollow gas channel extending throughout the center portion is formed, forcing the plastic resin to flow along an outer surface of the cavity. The vehicle grille guard obtains a substantially smooth exterior surface as the resin flows along the outer surface of the cavity.

BRIEF DESCRIPTION OF THE DRAWINGS

Additional objects and advantages of the present invention will become apparent from a reading of the following detailed description of the preferred embodiment which makes reference to the drawings of which:

Figure 1 is a perspective view of a first embodiment of a vehicle grille guard mounted on a front end of a vehicle;

Figure 2 is a perspective view of the vehicle grille guard shown in Figure 1;

Figure 2a is a perspective view of another embodiment of a vehicle grille guard; and

Figure 3 is a cross-sectional view taken along the 3-3 line of the embodiment of Figure 2 enclosed in a mold cavity.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures 1 and 2, there is shown a vehicle grille guard 10 mounted to a front end 12 of a vehicle 14. Grille guard 10 may be attached under the surface of bumper 16 of front end 12, or alternatively, attached to the chassis of the vehicle using conventional mounting components. In one embodiment, referring to Figures 1 and 2, the grille guard 10 generally includes a body 18 including a pair of spaced vertically disposed bars 20 and 22, each having a first end 24 and a second end 26, wherein the second end includes a substantially flat portion 28. Grille guard 10 includes an elongated loop 30 connected to and extending transversely from bars 20 and 22 at two different points, 32 and 34, respectively. Elongated loop 30 further includes first portion 36 and second portion 38. Grille guard 10 further includes a pair of horizontally extending bars 40 and 42. Elongated loop 30, horizontally extending bars 40 and 42, and vertically extending bars 20 and 22 may preferably be formed as an unitary structure as will be described in greater detail below. Optionally, first and second portions 36 and 38, respectively, of the elongated loop may be formed so as to curve slightly inward toward front end 12 of the vehicle.

Referring now to Figure 2a, a grille guard in accordance with another embodiment of the invention is identified generally as reference numeral 10'. Grille guard 10' is the same as grille guard 10 described above but grille guard 10' does not include elongated loop 30.

To produce the vehicle grille guard of the present invention, an extruded plastic resin is injected into a mold cavity having the geometry of the desired grille guard end product.

The plastic resin employed may, for example, be selected from acrylonitrile-butadiene-styrene (ABS) resins, acrylonitrile-butadiene-styrene/polycarbonate blends, polyesters, polyvinyls, polycarbonate/polyester blends, such as XENOY®, manufactured by GE Plastics, and mixtures thereof, among others. Regardless of the plastic employed, it is preferred that the resin is thermoplastic, has a high impact resistance and a flexural modulus of at least about 270,000 psi, and may be employed at a low temperature.

The use of plastic resin material as opposed to steel found in conventional grille guards results in a non-corrosive plastic grille guard that is approximately one-half the weight of steel guards. The low weight of a structural plastic grille guard also reduces the effect on air bags and other passive restraint systems in a vehicle. Moreover, plastic, as opposed to metal, has the ability to absorb energy without permanent deformation.

The present process is conducted by structural web or plastic web molding, a gas-assisted injection molding process that allows for the production of unitary or one piece grille guards at a lower cost than prior art multi-component grille guards. In addition, plastic web molding requires low pressure, subsequently allowing for reduced tooling budgets. Injection molding techniques allow for the production of more complex parts having closed cross sections, as compared to other molding procedures such as compression molding. In addition, many standard finishing

techniques may be utilized, including, but not limited to, molded-in color, body color paint, and chrome. Gas-assisted injection molding methods are well known in the art, as set forth in, for example, U.S. Pat Nos. 5,098,637 and 5,204,050, incorporated herein by reference, and need not be discussed in great detail here.

Structural web molding provides the vehicle grille guard of the present invention with increased strength and rigidity necessary for large structural parts. Additionally, the use of the structural web design provides an improved combination of rigidity and flexibility for the vehicle grille guard, allowing the design to be modified in order to meet different customer and vehicle requirements by adjusting the selection and design of attachments for mounting the grille guard, selection of material, cross-sections of the material, and process parameters.

The process of producing the vehicle grille guard of the present invention by gas-assist injection molding includes injecting a plastic resin into a mold cavity in an amount less than the total volume of the mold cavity. An inert gas is then injected into a center portion of the cavity and a hollow gas channel extending throughout the center portion is formed, forcing the plastic resin to flow along an outer surface of the cavity. A cross-sectional view of hollow bar 42 of grille guard 10 of a preferred embodiment grille guard enclosed within a mold cavity 44 is as shown in Figure 3. The geometry of mold cavity 44 includes a hollow center portion 46 and an outer surface 48. The inert gas may be injected into the mold cavity at the same location as the plastic is injected, or alternatively, at a separate location. The inert gas employed is selected from the group consisting of air, helium, neon, argon, carbon dioxide, nitrogen, and mixtures thereof.

Additionally, the vehicle grille guard obtains a substantially smooth exterior surface as a result of the resin flowing along the outer surface of the cavity. The smooth exterior surface produced is preferably a Class A surface, known in the automotive industry as a finished surface with very few defects and utilized on high visibility structural parts, such as grille guards and doors.

As set forth herein, the grille guard of the present invention may be formed as an unitary structure as shown in Figures 2 and 2a. In another exemplary embodiment of the present invention, the grille guard may be formed as a multiple component structure. For example, first and second portions 36 and 38, respectively, (see Figure 2), which function as brush guards and essentially wrap around and protect the vehicle's headlights, may be formed as separate components and added to the body of the grille guard. The grille guard in accordance with the teachings of the present invention, however, is not limited to the shapes as shown in the figures and may be molded into various geometries using the structural web process.

While the above description constitutes the preferred embodiment of the invention, it will be appreciated that the invention is susceptible to modification, variation, and change without departing from the proper scope or fair meaning of the accompanying claims.

WHAT IS CLAIMED IS:

1. A process of producing a vehicle grille guard comprising the steps of:

injecting a plastic resin into a mold cavity in an amount less than the total volume of said mold cavity;

injecting an inert gas into a center portion of said cavity; and

forming a hollow gas channel extending throughout said center portion, forcing said plastic resin to flow along an outer surface of said cavity;

wherein said grille guard obtains a substantially smooth exterior surface as said resin flows along said outer surface of said cavity.

2. The process according to claim 1, wherein said plastic resin is a thermoplastic resin.

3. The process according to claim 1, wherein said plastic resin is selected from the group consisting of acrylonitrile-butadiene-styrenes, acrylonitrile-butadiene-styrene/polycarbonate blends, polyesters, polyvinyls, polycarbonate/polyester blends, and mixtures thereof.

4. The process according to claim 1, wherein said inert gas is selected from the group consisting of air, helium, neon, argon, carbon dioxide, nitrogen, and mixtures thereof.

5. The process according to claim 1, wherein said smooth exterior surface is a Class A surface.

6. The process according to claim 1, wherein said vehicle grille guard is formed as one component.

7. The process according to claim 1, wherein said vehicle grille guard comprises multiple components.

8. The process according to claim 7, wherein said vehicle grille guard further comprises brush guard components.

9. A vehicle grille guard produced by gas-assisted injection molding according to a process comprising the steps of:

injecting a plastic resin into a mold cavity in an amount less than the total volume of said mold cavity;

injecting an inert gas into a center portion of said cavity; and

forming a hollow gas channel extending throughout said center portion, forcing said plastic resin to flow along an outer surface of said cavity;

wherein said grille guard obtains a substantially smooth exterior surface as said resin flows along said outer surface of said cavity.

10. The grille guard according to claim 9, comprising a body including a pair of spaced vertically disposed bars having first and second ends and a pair of horizontally extending bars connected to and extending transversely from said vertically disposed bars, wherein each of said vertically disposed bars includes a substantially flat portion located at said second end of said bar for mounting to said vehicle.

11. The grille guard according to claim 9, wherein said plastic resin is a thermoplastic resin.

12. The grille guard according to claim 9, wherein said plastic resin is selected from the group consisting of acrylonitrile-butadiene-styrenes, acrylonitrile-butadiene-styrene/polycarbonate blends, polyesters, polyvinyls, polycarbonate/polyester blends, and mixtures thereof.

13. The grille guard according to claim 9, wherein said inert gas is selected from the group consisting of air, helium, neon, argon, carbon dioxide, nitrogen, and mixtures thereof.

14. The grille guard according to claim 9, wherein said smooth exterior surface is a Class A surface.

15. The grille guard according to claim 10, wherein said grille guard is formed as one component.

16. The grille guard according to claim 15, wherein said pair of horizontally extending bars comprise an elongated loop.

17. The grille guard according to claim 10, wherein said grille guard comprises multiple components.

18. The grille guard according to claim 17, wherein said grille guard comprises brush guard components connected to said horizontally extending bars.

ABSTRACT OF THE INVENTION

The present invention provides a new and improved process of producing vehicle grille guards by gas-assisted injection molding and the grille guards produced thereby. The process includes injecting a plastic resin into a mold cavity in an amount less than the total volume of the mold cavity. An inert gas is then injected into a center portion of the cavity and a hollow gas channel extending throughout the center portion is formed, forcing the plastic resin to flow along an outer surface of the cavity.

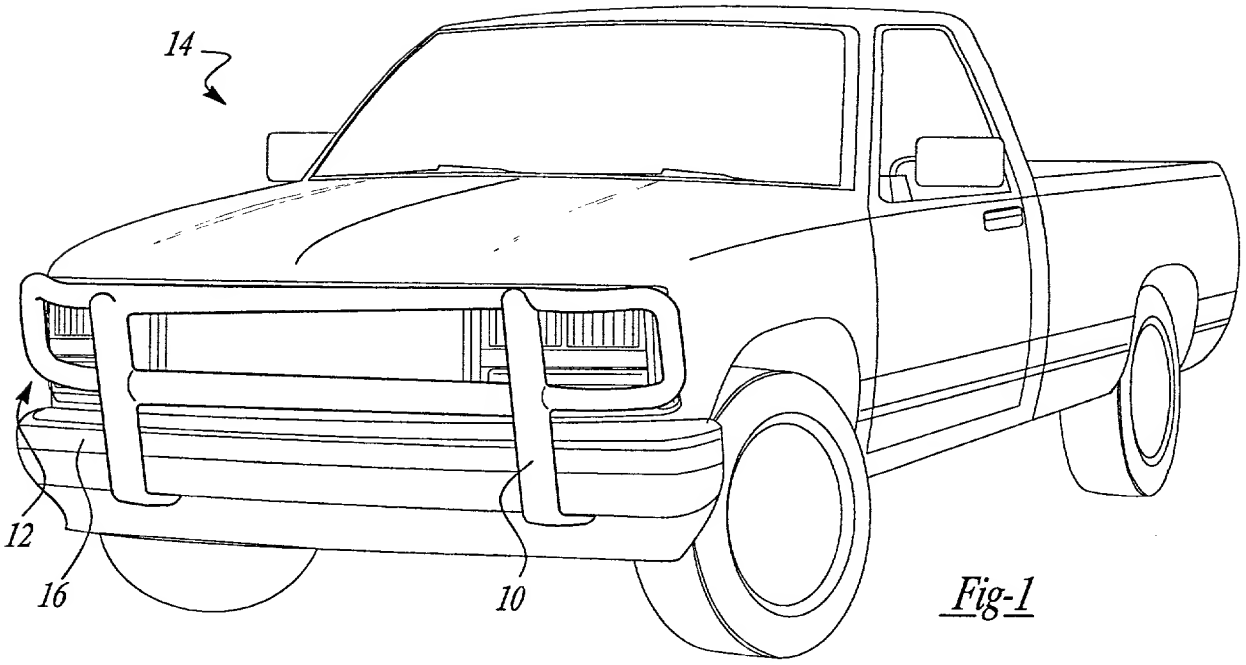

Fig-1

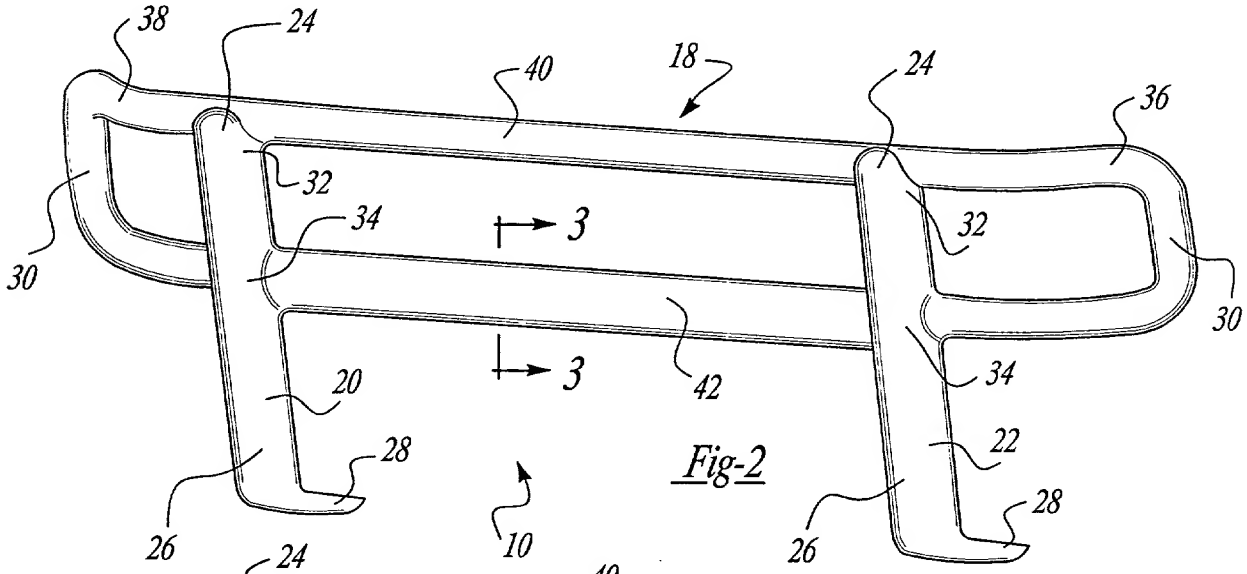

Fig-2

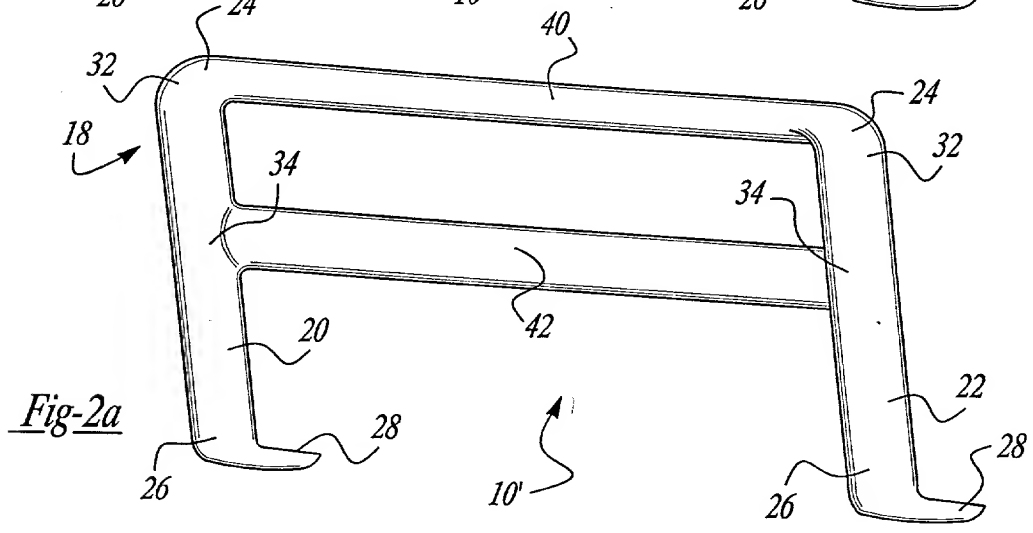

Fig-2a

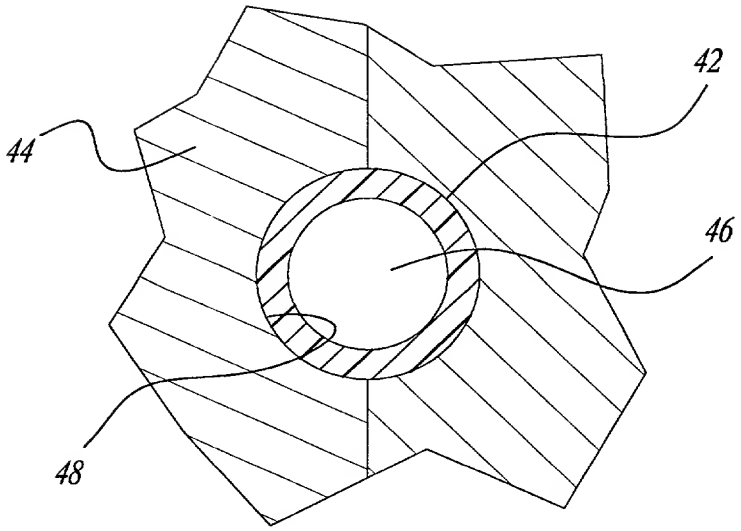

Fig-3

Attorney Docket No. 7939-000008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit:
Examiner:
Inventor(s): Floyd R. Dickson and Lino C. Mallia
Serial No.
Filed:
For: **STRUCTURAL WEB AUTOMOTIVE GRILL GUARD**

Patent No.
Issued:

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

[ ] the owner of the small business concern identified below:
[X] an official of the small business concern empowered to act on behalf of the concern identified below:

Name Of Concern: Algonquin Automotive

Address Of Concern: #1 Crescent Road

Huntsville, Ontario P1H1Z6

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.1301-.1305, and referenced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that exclusive rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in

[X] the specification filed herewith.
[ ] the application whose serial number is set forth above.
[ ] the patent set forth above.

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27(c)) - SMALL BUSINESS CONCERN

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statement may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Signed: Don Waddington Date: November 21/97.

Name Of Person Signing: DON WADDINGTON.

Title Of Person If Other Than Owner: PRESIDENT, ADVANCED DEVELOPMENT DIVISION. ALGONQUIN AUTOMOTIVE.

Attorney Docket No. 7939-000006

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

STRUCTURAL WEB AUTOMOTIVE GRILLE GUARD

the specification of which (check one)

[X] is attached hereto.

[ ] was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

			Priority Claim	
(Number)	(Country)	(Day/Month/Year filed)	Yes	No
(Number)	(Country)	(Day/Month/Year filed)	Yes	No
(Number)	(Country)	(Day/Month/Year filed)	Yes	No

DECLARATION AND POWER OF ATTORNEY

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States Provisional application(s) listed below:

PRIOR PROVISIONAL APPLICATIONS

(application serial number)	(Month / Day / Year filed)
(application serial number)	(Month / Day / Year filed)

I hereby claim the benefit under Title 35, United States Code, section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	**Filing Date**	**Status - patented, pending, abandoned**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint H. Keith Miller, Reg. No. 22,484, Michael J. Schmidt, Reg. No. 34,007, and each principal, attorney of counsel, associate and employee of Harness, Dickey & Pierce, P.L.C., who is a registered Patent Attorney, my attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. I request the Patent and Trademark Office to direct all correspondence and telephone calls relative to this application to Harness, Dickey & Pierce, P.L.C., P. O. Box 828, Bloomfield Hills, Michigan 48303 (248) 641-1600.

Full name of sole or first inventor: Floyd R. Dickson

Inventor's signature: _____

Date: Nov. 21/97

Residence: 112 Hoodstown Shores Blvd., Huntsville, Ontario P1H 2K7, CANADA

Citizenship: CANADA

Post Office Address: same as above

DECLARATION AND POWER OF ATTORNEY

Full name of second joint inventor, if any: Lino C. Mallia

Second Inventor's signature: Lino Mallia

Date: Nov 21/97

Residence: 37510 Jefferson, Harrison Township, Michigan 48045

Citizenship: CANADA

Post Office Address: same as above